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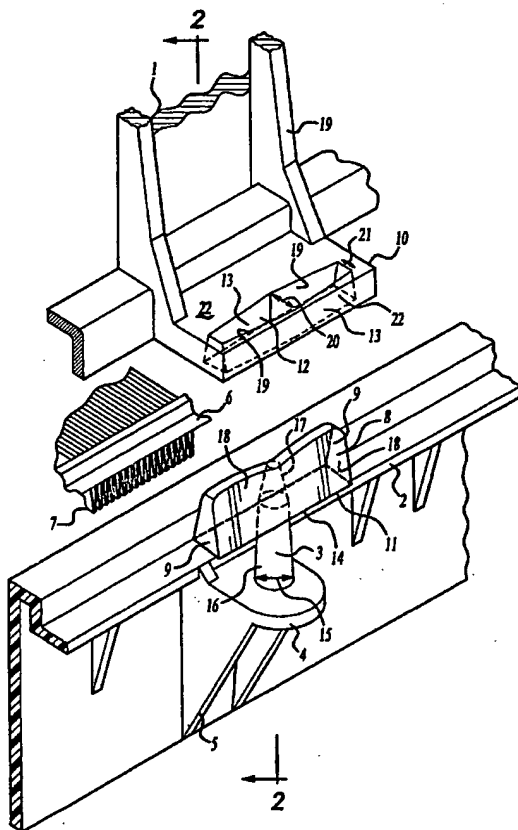
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(54) Title: **TORSIONAL SNAP FIT CONNECTOR FOR AIR FILTER COVER**



(57) Abstract: A structure for securing the top and bottom cover portions of an air filter includes a wing member secured to the bottom cover portion. The wing member is attached to the cover portion through a post. The wing member has a wedged surface which is selectively moved along a wedged surface on a slot in the upper cover surface. The wedged surfaces cam the wing member to pivot. Once the wing member has moved through the slot, it is biased back and in a direction opposed to the rotation caused by the wedged surfaces. The wing member is thus secured on a surface on the upper cover member adjacent the slot. The wing member thus secures the two cover members in a snap fit connection. To release the snap fit connection, one merely biases the wing member in an opposed direction.

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**TORSIONAL SNAP FIT CONNECTOR**  
**FOR AIR FILTER COVER**

This application claims priority to provisional application 60/158,182 filed  
5 October 7, 1999.

**BACKGROUND OF THE INVENTION**

This invention relates to an improved cover, which may be utilized for an air filter to provide a resilient snap fit.

10 As is known, air filters are utilized to filter the air passing from a source of air to a vehicle engine. Typically, the air filter is captured between an upper cover and a lower cover. The two covers are secured together in some fashion. Typically, wing bolts having threaded nuts secured onto the bolts hold the two cover portions together.

However, as is known, the vehicle engine is subject to a good deal of vibration.  
15 Thus, the wing nut connection has not always provided a good connection over time. Moreover, it is relatively time consuming to remove the nut and then resecure the nut.

**SUMMARY OF THE INVENTION**

In a disclosed embodiment of this invention, an air cleaner upper cover is secured  
20 to a lower cover by a snap fit connection. More preferably, the snap fit connection includes at least one wing member having a wedged surface, which extends through a wedged surface slot in the other cover member. The two cover members are aligned with the slot in the one cover member aligned with the wedged wing surface. As the wing surface moves through the slot, the two wedges on the slot and the wing cam the  
25 wing away from the slot wedge surface. Once the wing portion has moved through the slot, the wing twists back over the surface adjacent the slot.

Most preferably, the wing portion is provided on a post, and the post extends through the slot after the wing has moved entirely through the slot. This post receives a torsion force as the wing is being cammed through the slot. This torsion force returns  
30 the wing to a relaxed position once it has passed through the slot. In a most preferred embodiment of this invention, the wing has wedge surfaces spaced on opposed sides of

the post, as does the slot. In this way, surfaces on both sides of the post are applying a torsion force to the post as the wing moves through the slot.

The present invention thus provides a resilient snap fit connection for holding two cover portions together. Most preferably, the two cover portions secure a filter element  
5 for a vehicle engine.

To remove the cover portions the wing is simply turned in an opposed direction, similar to that achieved by the wedge surface in the slot. The two cover portions may then be moved away from each other with the wing portion moving through the slot.

These and other features of the present invention can be best understood from the  
10 following specification and drawings. The following of which is a brief description.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 is a perspective view showing the main components of the inventive cover mechanism.

15 Figure 2 is an assembled cross-sectional view.

Figure 3 is a top view showing portions of the snap fit connection.

### **DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT**

As shown in Figure 1, a filter assembly 20 has a top cover portion 1 secured to a bottom cover portion 2. A post 3 is formed off of a flange 4 attached by gussets 5 to the body of the lower cover 2. A filter seal 6 and a filter element 7 are positioned on  
20 the lower cover 2. The upper cover 1 is removable from the lower cover portion, and may pivot, or may be movable in any other known direction.

A wing 8 is secured to the post 3, and has a pair of wing portions 9. A slot flange 10 in the upper cover 1 has a slot 12 to receive a wedged surface 11 from the wing portions 9. Wedged portions 11 move through slot 12, which has mating wedged  
25 portions 13. A bottom end 14 of the wing 8, will sit atop overlap surfaces 22 once the wing has moved through the slot. An axis 15 of the post 3 receives torsion as the wing is pivoted by the wedged surfaces. Flat surfaces 18 on the wing 8 are formed on an opposed face of the wing portions 9 from the wedged surfaces 11. Similarly, flat  
30 surfaces 19 are formed in the slot 12 on opposed surfaces from the wedges 13.

As can be seen, a dimension 21 of the slot 12 is sufficient to receive the width of the wing portions at their lower most extent.

As shown in Figure 2, when the upper portion 1 is mounted onto the lower portion 2, the wing 8 has moved through the slot 12. Wedged surfaces 13 have cammed the wedge surface 11 from the wing portions 9. This causes the wing portions 9 to pivot relative to the central axis 15. This causes a torsion force in the post 3. Once the wing 9 has moved through the slot 12, the wing portions 9 pivot back due to the torsion built up in the post 3. The wedged portions 11 of the wing portions 9 thus overlap the overlap areas 22 on the slot flange 10 of the upper part 1. As shown in this figure, it can be appreciated that to remove the wing portion 8, the wing portions are merely pivoted in the same direction as cammed by the wedged surfaces, at which time the upper cover 1 can be removed from the lower cover 2.

Figure 3 is a top view showing the overlap areas 22 covered by the wedged surfaces 11 of the wing portions 9. As can be seen, there is clearance forward of the flat portions 19 such that should one pivot the wing portions 9 counterclockwise as shown in Figure 3, the slot 12 may then be moved off of the winged portions.

The present invention provides a simple and secure way for securing two cover portions of an air filter system together. Although a preferred embodiment of this invention has been disclosed, a worker in this art would recognize that many modifications would come within the scope of this invention. For that reason the following claims should be studied to determine the true scope and content of this invention.

**CLAIMS**

1. A cover for an entrapped element comprising:  
a bottom portion and a top portion with an entrapped element entrapped  
between said top and bottom portions; and  
5           securement structure for securing said top and bottom portions together,  
said securement structure including a wing member having a wedged surface on one  
face, and associated with one of said top and bottom portions, and a slot formed on the  
other of said top and bottom portions, said slot having a mating wedged surface for  
10   mating with said wedged surface on said wing portion, such that when said wing portion  
is moved through said slot said mating wedged portions cause said wing portion to pivot  
in a first direction, and said wing portion snapping back opposed to said first direction  
once said wing portion has passed through said slot to overly a surface adjacent said slot  
and secure said top and bottom cover portions together.
- 15       2. A cover as set forth in Claim 1, wherein an air filter element is the  
element captured between said top and bottom cover portions.
3. A cover as set forth in Claim 1, wherein said wing portion is connected  
to said one cover portion by a post, and said wing portion moving through said slot with  
20   said post being received in said slot after said wing portion has passed through said slot.
4. A cover as set forth in Claim 3, wherein there are a pair of said wing  
portions spaced on each side of said post.
- 25       5. A cover as set forth in Claim 3, wherein said post is attached to said one  
cover portion by a gusset structure extending from an outer surface of said cover portion.
6. A cover surface as set forth in Claim 1, wherein said wing portion is  
associated with a lower cover member.

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7. A cover as set forth in Claim 1, wherein said slot is formed with a flat surface on a side opposed to said wedged surface, and said wing portion is provided with a flat surface on the side opposed to said wedged surface.

5 8. A cover and filter comprising:  
a bottom portion and a top portion with an entrapped filter element entrapped between said top and bottom portions; and  
securement structure for securing said top and bottom portions together, said securement structure including a wing member associated with one of said top and  
10 bottom portions, and a slot formed on the other of said top and bottom portions, said wing portion snapping to a locked position to overlay a surface adjacent said slot and secure said top and bottom cover portions together.

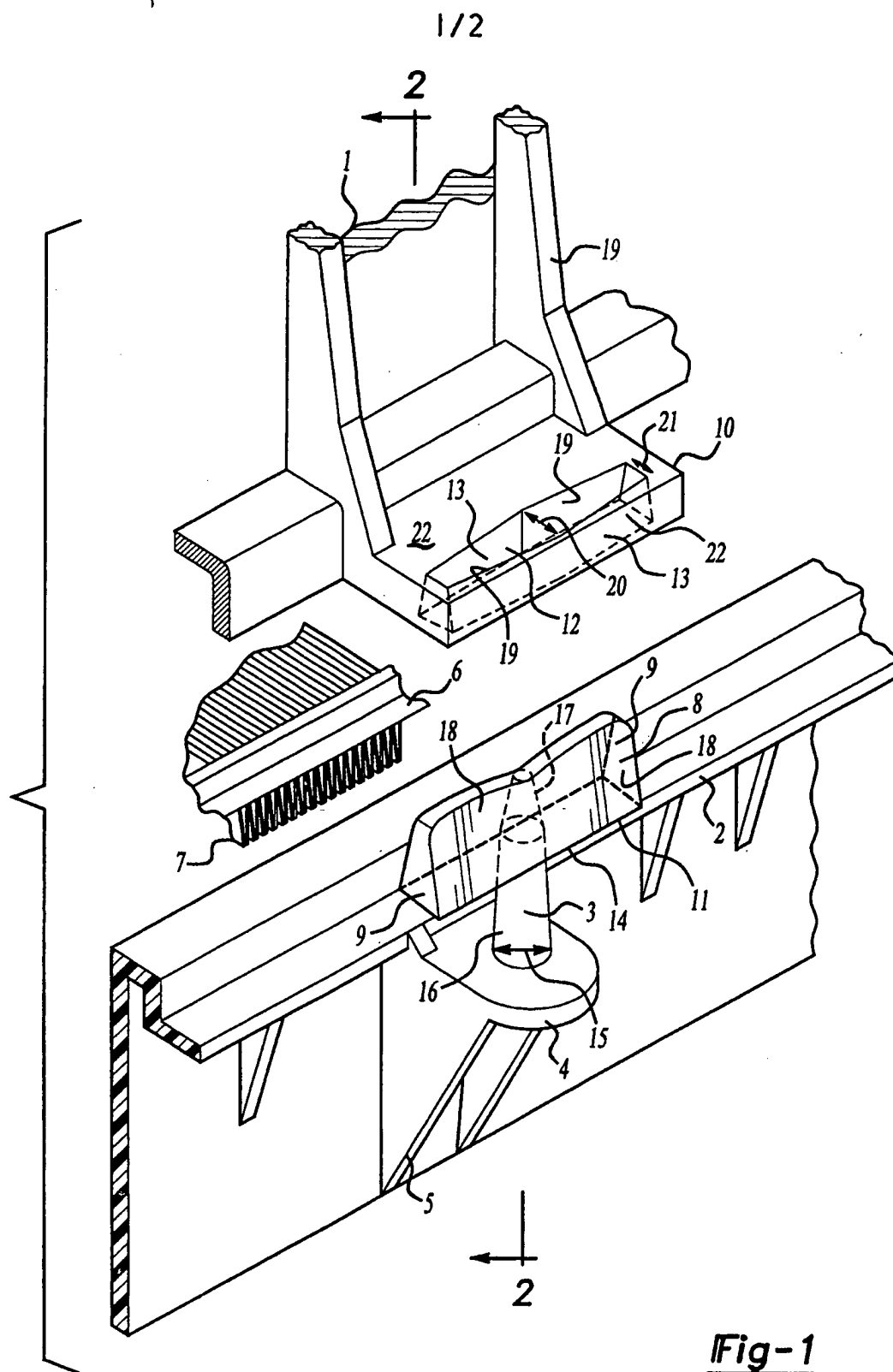
9. A cover as set forth in Claim 8, wherein said wing portion is connected  
15 to said one cover portion by a post, and said wing portion moving through said slot with said post being received in said slot after said wing portion has passed through said slot.

10. A cover and filter as set forth in Claim 9, wherein said slot and said wing  
20 portions have wedged portions which cam said wing portion to pivot in a first direction, said wing portion snapping back in an opposed direction after passing through said slots.

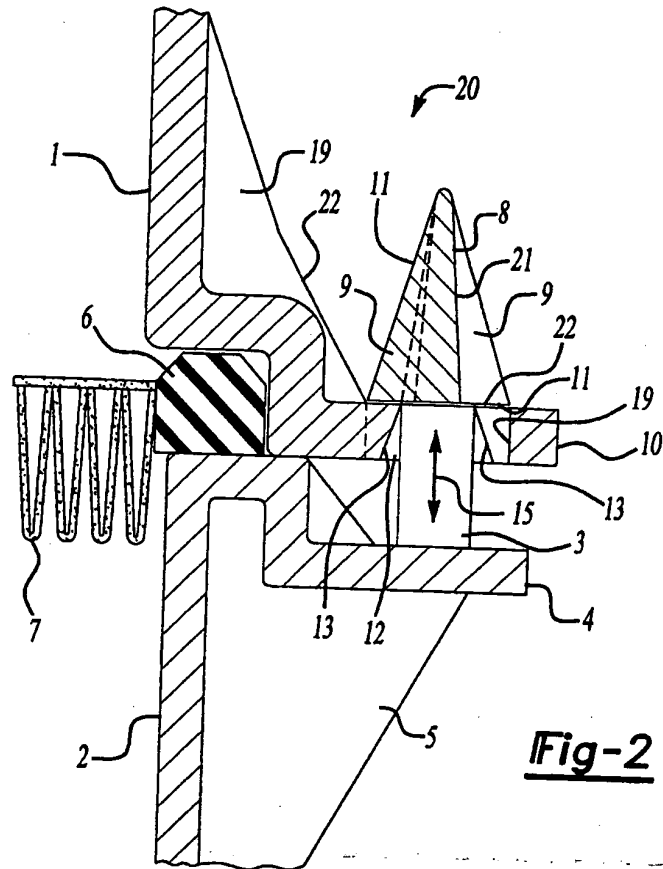
11. A cover as set forth in Claim 10, wherein there are a pair of said wing  
portions spaced on each side of said post.

25 12. A cover as set forth in Claim 10, wherein said post is attached to said one cover portion by a gusset structure extending from an outer surface of said cover portion.

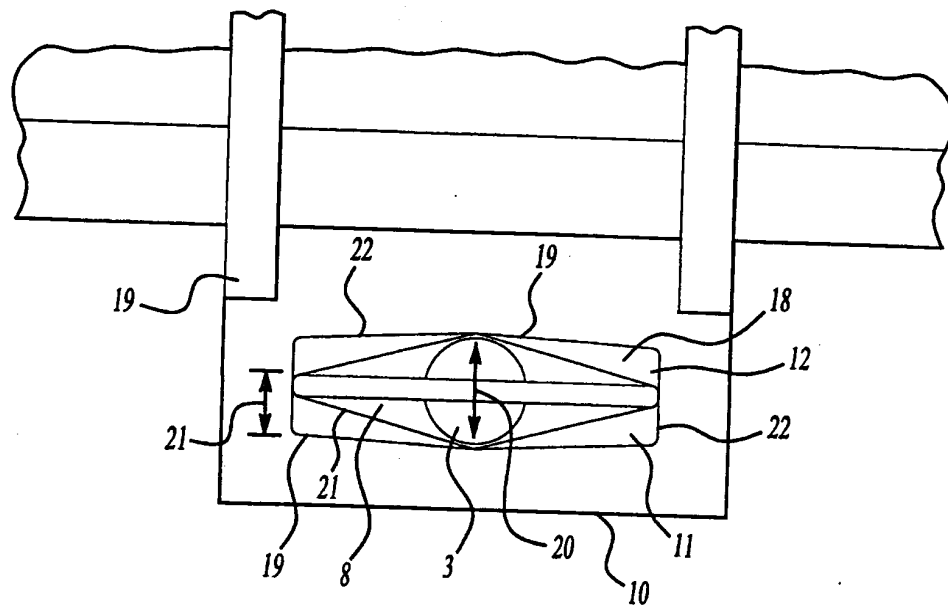
13. A cover as set forth in Claim 10, wherein said slot is formed with a flat  
30 surface on a side opposed to said wedged surface, and said wing portion is provided with a flat surface on the side opposed to said wedged surface.



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**Fig-2**



**Fig-3**



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 00/01169

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B65D45/18 B01D46/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 825 110 A (F. HALBICH ET AL.) 23 July 1974 (1974-07-23) claim 1; figures 1,4 ---	1
A	US 4 782 561 A (E. HAYAMA) 8 November 1988 (1988-11-08) claim 1; figures 3,4 ---	1
A	US 5 295 602 A (J. S. SWANSON) 22 March 1994 (1994-03-22) claim 1; figures 1-3 ---	1,2
A	US 5 947 462 A (J. ROUSSEL) 7 September 1999 (1999-09-07) the whole document -----	1,2

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- \*G\* document member of the same patent family

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3825110	A	23-07-1974	NONE	
US 4782561	A	08-11-1988	DE 3809834 A	03-11-1988
US 5295602	A	22-03-1994	NONE	
US 5947462	A	07-09-1999	NONE	